

FEED CONVERSION RATIO OF MAJOR CARP *CIRRHINUS MRIGALA* FINGERLINGS FED ON COTTON SEED MEAL, FISH MEAL AND BARLEY

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ABSTRACT

A six-week experiment was conducted in six glass aquaria to study the feed conversion ratio (FCR) of *Cirrhinus mrigala* fingerlings fed on cotton seed meal (35.69% CP), fish meal (50.41% CP) and barley (9.98% CP). The ingredients were supplied at the rate of 4% of wet body weight of fingerlings twice a day. Twenty fingerlings were randomly stocked in each aquarium. The *Cirrhinus mrigala* fingerlings gained highest average body weight on fish meal (1.23g), followed by cotton seed meal (1.17g) and barley (0.55g). FCR calculated for three treatments was highest for barley (2.59), followed by fish meal (2.02) and cotton seed meal (1.55). The correlation coefficient between average body weight and FCR values was significant and positive in case of cotton seed meal and fish meal, whereas it was positive and non significant in case of barley.

Key Words: Major carps, FCR, fish meal, cotton seed meal, barley.

INTRODUCTION

The feed conversion ratio (FCR) is a good tool to measure the acceptability and suitability of artificial feed for fish. The proper information of FCR on locally available ingredients can provide the basis to develop acceptable feed, though the task of preparing acceptable and suitable artificial feed for major carps is complicated one due to their feeding preference. The FCR values of various fish feed ingredients for carps under controlled conditions have been estimated by many workers (Chang *et al*, 1983; Jhingran, 1991).

Jhingran (1991) has also stated that value of conversion rate, besides depending upon the nutrients contents of feed, also varies with the method of presentation of food to the fish, environmental factors such as temperature, dissolved oxygen, and size of fish. He further reported that no reliable data have been obtained on the rate of conversion of feed into fish flesh.

Taking under consideration the importance of FCR, there is a need to evaluate the locally available feed ingredients for obtaining reliable data on rate of conversion of feed into the fish flesh. Therefore, the present project was planned to study the FCR of *Cirrhinus mrigala* fed on three locally available feed ingredients, i.e. cotton seed meal, fish meal and barley.

MATERIALS AND METHODS

The experiment was conducted to study the FCR, of *Cirrhinus mrigala* fingerlings fed on cotton seed meal (35.69% CP), fish meal (50.41% CP) and barley (9.98% CP). *Cirrhinus mrigala* fingerlings were obtained from Government Fish Seed Hatchery, Satiana Road, Faisalabad. The fingerlings were stocked in cemented tank for two weeks conditioning period to adjust on ingredients used in feeding experiment.

The experiment was run in six aquaria with dimension of 60x44x44 cm³. After acclimatization, 20 fingerlings were randomly stocked in each aquarium. The average initial weight of fingerlings was noted. Each aquarium was filled with water up to level of 25 cm and the level was maintained throughout the experimental period. There were two replicates of each treatment. Dissolved oxygen and pH of water in each aquarium were maintained by changing water daily and by using air pump. The water temperature during study period ranged between 23.0 and 25.0°C. Ingredients (cotton seed meal, fish meal and barely) were offered at 4% of wet body weight of fingerlings twice a day.

Fingerlings were taken from each replicate on weekly basis for recording wet weight (g). The feed was stopped one day before the weight was recorded. The mean weight of fingerlings in each aquarium was calculated to workout the feeding rate for the next week.

The feed conversion ratio was worked out according to the following formula (Jhingran, 1991):

$$\text{Feed conversion ratio} = \frac{\text{Quantity of feed taken}}{\text{Weight increased}}$$

The data were subjected to statistical analysis. The comparison of mean values was made by using analysis of variance and Duncan's Multiple Range Test, following Steel and Torrie (1986) with the help of software program i.e. MSTATC[®] and Micro Stat[®].

RESULTS

Growth rate

The over all growth pattern of *Cirrhinus mrigala* fingerlings fed on three ingredients is shown in Fig. 1. The growth trend of *Cirrhinus mrigala* on cotton seed meal (T1) during 1st and 2nd week was sharply higher. However, this trend of growth was not maintained and the growth after 2nd week was slightly lower. During the 3rd and 4th week, the fingerlings again attained sharp growth. Beyond the 4th week the growth of fish was slowed down. This trend of growth was observed up to 6th week. The growth pattern of *Cirrhinus mrigala* fingerlings on fish meal (T2) was different from the cotton seed meal (T1). In the 1st week the fingerlings attained the maximum growth. From 2nd to 4th week, the growth trend was sharp and somewhat similar to growth trend observed during 1st week. During 4th to 6th week, fingerlings showed poor growth and followed the same pattern recorded on T1. As regards the growth trend of *Cirrhinus mrigala*, fingerlings on barley (T3) showed

poor growth during the entire six weeks period and this growth was lower than T2 and T1. The higher growth of fingerlings on fish meal (T2) indicated that the response of the fish on T2 was better than T1 and T3 and this ingredient could be considered as preferable feed.

Statistical analysis revealed that the effects of three ingredients on average body weight of *Cirrhinus mrigala* among six weeks were significant ($P < 0.05$). The average mean body weight was significantly higher on fish meal ($1.23 \pm 0.04\text{g}$), followed by cotton seed meal ($1.17 \pm 0.00\text{g}$) and barley ($0.55 \pm 0.01\text{g}$). The interaction between weeks and treatments was also highly significant. Multiple comparison of mean values of three treatments showed that the growth of fingerlings was significantly higher on T2, followed by T1 and T3.

Feed conversion ratio

Fig.2. represents the trend followed by the FCR values of *Cirrhinus mrigala* fed on three ingredients. In the first week, the barley gave higher FCR value, followed by cotton seed meal and fish meal. The lower FCR value on fish meal indicates that the fingerlings had converted this ingredient more efficiently into flesh as compared to cotton seed meal or barley.

In the 2nd week, the trend of FCR values was changed. The maximum and minimum FCR values were on barley and cotton seed meals, respectively. This indicates that in the 2nd week the cotton seed meal remained more suitable ingredient than fish meal or barley.

In the 3rd week, the barely gave higher FCR value, followed by cotton seed meal and fish meal. So the more suitable ingredient appeared to be fish meal. In the 4th week, the pattern of FCR value on three treatments was the same as observed during 1st week. In the 5th week, the trend was changed. The maximum FCR value was on fish meal and the lowest FCR value was shown by cotton seed meal.

In last week of the study, the FCR values followed the same trend observed during 3rd week. The maximum and minimum FCR values were on barley and cotton seed meals, respectively. The over all average FCR was the highest for barley (2.59), followed by fish meal (2.02) and cotton seed meal (1.55).

Statistical analysis revealed that FCR values of *Cirrhinus mrigala* on three ingredients differed significantly ($P < 0.05$). The effect of weeks on feed conversion ratio was also statistically highly significant ($P < 0.01$). However, the interaction between weeks and treatments was non significant. The correlation coefficients between average body weight and FCR revealed that correlation between two factors was positively significant in case of cotton seed meal (0.598) and fish meal (0.672) and in barely it was positive (0.571) but non significant.

DISCUSSION

The over all growth pattern of fingerlings *Cirrhinus mrigala* remained highest for fish meal, followed by cotton seed meal and barley. These results

showed the feeding preference of fingerlings *Cirrhinus mrigala* on fish meal and cotton seed meal, which might be due to presence of higher crude protein contents in both ingredients. Fingerlings of *Cirrhinus mrigala* prefer to eat the diet having higher crude protein contents. The present results substantiate the findings of Rajbanshi *et al.* (1989), who reported that 45 days old rohu (*Labeo rohita*) fingerlings gave the highest growth rate on diets containing 39.18% protein than diets containing 25.4% protein. Similarly, Salim and Sheri (1999) observed significant influence of high protein diets (50%) on growth performance of *Cirrhinus mrigala* fingerlings, followed by medium protein diets (45%) and low protein diet (40%). The overall FCR was observed to be highest for barley (9.98% CP), followed by fish meal (50.41% CP) and cotton seed meal (35.69% CP). Similarly, Seema *et al.* (2002) monitored the FCR of major carp *Cirrhinus mrigala* fingerlings fed on rice polish (10.6% CP), maize oil cake (22.4% CP) and rice broken (7.6% CP) and reported that fingerlings gained higher body weight and lowest FCR on maize oil cake as compare to other ingredients. This means that fish had used less quantity of maize oil cake for gaining higher body weight. These results supported the observation of the present study regarding the feed preference of fish towards the ingredients with higher protein level.

The correlation between FCR and average body weight was significantly positive in case of cotton seed meal (0.598) and fish meal (0.672), while for barely (0.571) it non significant. The correlations recorded in the present study are similar to the results given by

Faturoti (1989), who reported that the feed intake, protein intake and FCR were positively correlated with average fish weight gain. Qadoos (2000) also observed non significant and positive correlation of FCR and average body weight ($r = 0.4792$) in case of rice polish and highly significant and positive correlation ($r = 0.9313$) in case of maize oil cake.

The result of this study lead to the conclusions that cotton seed meal and fish meal are more suitable and acceptable ingredients than barley for the better growth of fingerlings of *Cirrhinus mrigala* and these ingredients can be included in the diet of the fish.

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